**Cobra Invitational Microbe Mission Answer Key**

**Station 1**

***Part 1: Identify the type of microscope based on the information provided (some may have more than one possible answer).***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Compound | Stereoscope | Confocal | SEM | TEM |

1. Uses laser light as a source of radiation for image formation. **Confocal**
2. Uses visible light for a source of radiation for image formation. **Compound or Stereoscope**
3. Uses a vacuum as a medium. **SEM or TEM**
4. Specimens are mounted on thin films of a supporting material on copper grids. **TEM**
5. Specimens are mounted on aluminum stubs and coated in gold. **SEM**
6. Specimens are not mounted on anything. **Stereoscope**
7. This type of microscope has a low magnification. **Stereoscope**
8. This type of microscope uses electron illumination with a 3-D image. **SEM**
9. This type of microscope uses electron illumination with a 2-D image. **TEM**
10. This type of microscope gives you an image in black and white. **SEM**

***Part 2: Use the microscope at the station to answer the following questions***

1. What part of the microscope is labeled “A”? **Ocular Lens**
2. What part of the microscope is labeled “B”? **Objective Lens**
3. What part of the microscope is labeled “C”? **Corse Focus**
4. What part of the microscope is labeled “D”? **Diaphragm or condenser**
5. What is the total magnification of an object viewed with the yellow lens? **100 X**
6. When you view one of the *Allium root tip mitosis* slides, how wide is one of the root tips in microns? **500 – 1000 microns**
7. How many microns wide is the field of view of this microscope when viewed under 40x magnification? **4500 microns**

***Part 3: Answer the following questions about the principles of microscopy***

1. Is resolution best when the distance separating two objects is small or large? **Small**
2. Typically, the highest magnification that a compound microscope can have is (circle one)
   1. 40X b. 100X c. 400X d. 800X **e. 1000X** d. There is no limit
3. Based on the numerical aperture formula, what type of light wavelength provides for better resolution, longer wavelengths or **shorter wavelengths**?
4. What does the term parfocal mean in microscopy? **The ability for a microscope to remain in focus when switching between objective lenses.**
5. What term for a lens describes the size of the smallest object that can be seen with it? **Resolving Power**.
6. Why does immersion oil placed between a lens and a glass slide increase resolution? **Light does not bend (refract) as it leaves the glass slide. Light is able to travel in a straight line directly into the glass of the objective lens.**
7. As magnification increases, what happens t the size of the field of view? **Decreases**

**Station 2**

Fill in the blank. Please write legibly. If the answer cannot be understood it will be incorrect.

ANIMAL CELL:  
look at the diagram and identify each of the labeled parts.

1. **Endoplasmic reticulum**
2. **Nucleus**
3. **Cytoplasm**

**D. Golgi body**

**E. Mitochondrion**

PLANT CELL:  
look at the diagram and identify each of the labeled parts.

**F. Vacuole**

**G. Mitrochondira**

**H. Endoplasmic reticulum**

**I. Cell wall**

**J. Golgi apparatius**

**K. Identify two differences between a plant cell and an animal cell.**

**1. Plant cells have –cell wall, vacuoles, chloroplasts**

**2. Animal cells have – centrioles, ribosomes.**

**L. Identify two similarities between a plant cell and an animal cell.**

**1. both have -> endoplasmic reticulum, nucleus, ribosomes,**

**2. cytoplasm, chromosomes, cell membrane**

**Station 3**

***Part 1: Use the two specimens under Microscope A and B to complete the chart.***

Complete the chart comparing the specific differences between prokaryotic and eukaryotic cells.

|  |  |  |
| --- | --- | --- |
|  | **Prokaryotes** | **Eukaryotes** |
| Approximate size (μm) | 1. 1-5 μm | 1. 10-199 μm |
| Location of genetic material | 1. Nucleoid | 1. Nucleus |
| Genetic material membrane-bound | 1. No | 1. Yes |
| Replication mechanism | 1. Binary Fission | 1. Cell Division |
| Contains plasmids | 1. Yes | 1. No |

**Part 3: Answer the following questions about prokaryotes and eukaryotes.**

11. Eukaryotic

12. Circular Cells or membrane bound nucleus

13. Increase the resistance to pathogens.

14. **A)** Eukaryote, Prokaryotes, Viruses, Proteins, Small Molecules, Atoms

**Station 4**

**Each of these diseases are caused by a specific type of microbe.**

**On your answer page write the letter that matches each disease with its microbial origin.**

**B = Bacterial F = Fungal P = Protozoan V = Virus W = Parasitic Worms**

**PART ONE**

11. PGiardiasis

12. WHookworm

13. VInfluenza

14. B. Legionnaires

15. BLyme disease

16. PMalaria

17. VMono

18. BMRSA

19. BPertussis

20. VPolio

21. FPotato blight-

22. V Rabies

23. FRingworm

24. VRubella

25. W Schistosomiasis

26. BStrep

27. W Tapeworm

28. BTetanus

29. FThrush

30. WTrichinosis

1. BAnthrax

2. FAthletes foot

3. BBotulism

4. BChlamydiasis

5. BCholera

6. BDental Dise

7. FDutch elm

8. VEbola

9. FErgotism

10. PEstuary Asso.

Sydrome

**PART TWO – Fill in the Blank**

*Spelling does count* because ***you may copy*** the accurate spelling from the list above.

Identify the disease that matches the symptoms, or antidote describe in each question.

31. **Rubella** Which virus has no specific treatment but does have an effective vaccine?

32. **Ergotism** Which disease is caused by an organism that can causes hallucinations

when eaten?

33. **Pertussis** What disease is more dangerous for infants that adults? There is a vaccine.

34. **Malaria**

**West Nile** Identify a diseases that can be carried by mosquitoes.

35. **Cholera** What disease is caused by an organism in carried in contaminated water.

**Station 5**

1. A
2. C
3. D
4. B
5. D
6. A
7. A
8. B, D
9. C
10. D
11. B
12. A
13. 3
14. 4
15. D
16. B

**Station 6**

***Part 1***

1. B
2. A
3. D
4. 27.5 minutes
5. C
6. A, D, E
7. A
8. B

***Part 2***

1. B (cowpox virus used to inoculate humans)
2. B (yogurt)
3. H ( causes Meningitis)
4. H (causes pneumonia)
5. B ( produce various [antibiotics](https://en.wikipedia.org/wiki/Antibiotic))
6. H (causes Yellow fever)
7. H (fungus that causes skin infections)

**Station 7**

1. A. **Lag Phase**

Any 2 below are acceptable for B & C

* Period or adjustment to new conditions
* Little or no cell division occurs
* Population size does not increase
* Phase of intense metabolic activity in which individual organisms grow in size
* May last from one hour to several days

1. A. **Log Phase or Exponential Growth Phase**

Any 2 below are acceptable for B & C

* Cells begin to divide and generatation time reaches a constant minimum
* Period of most rapid growth (# of cells produced > than # of cells dying)
* Cells are at highest metabolic activity
* Cells are most susceptible to adverse environmental factors (radiation & antibiotics)

1. A. **Stationary Phase**

Any 2 below are acceptable for B & C

* Population size begins to stabilize
* Period of most rapid growth (# of cells produced = than # of cells dying)
* Overall cell number does not increase
* Cell division begins to slow
* Factors that slow down growth (accumulation of toxic waste materials, acidic pH of the medium its growing in, limiting nutrients, insufficient oxygen supply)

1. A. **Death Phase or Logarithmic Decline phase**

Any 2 below are acceptable for B & C

* Population size begins to decrease
* Period of most rapid growth (# of cells produced < than # of cells dying)
* Cell number decreases at a logarithmic rate
* Cells lose their ability to divide
* A few cells remain alive for a long period of time.

1. Lag
2. Log Phase
3. Death or Decline